

MATERIAL SAFETY DATA SHEET

1. SUBSTANCE AND SOURCE IDENTIFICATION

National Institute of Standards and Technology
Standard Reference Materials Program
100 Bureau Drive, Stop 2300
Gaithersburg, Maryland 20899-2300

SRM Number: 2745
MSDS Number: 2745
SRM Name: Carbon Dioxide in Nitrogen

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Description: This SRM mixture is supplied in a DOT 3AL specification aluminum (6061 alloy) cylinder with a water volume of 6 L. Mixtures are shipped with a nominal pressure exceeding 12.4 MPa (1800 psi), which provides the user with 0.73 m³ (25.8 ft³) of useable mixture. The cylinder is the property of the purchaser and is equipped with a CGA-580 brass valve, which is the recommended outlet for this carbon dioxide mixture. NIST recommends that this cylinder **NOT** be used below 0.7 MPa (100 psi).

Substance: Carbon Dioxide/Nitrogen Compressed Gas Mixture.

Other Designations: Carbon Dioxide (carbon oxide)/Nitrogen (dinitrogen) compressed gas mixture.

2. COMPOSITION AND INFORMATION ON HAZARDOUS INGREDIENTS

Component	CAS Registry	EC Number (EINECS)	Concentration
Carbon Dioxide	124-38-9	204-696-9	16 % mol/mol *
Nitrogen	7727-37-9	231-783-9	balance

* Concentration applies to the identified NIST cylinder.

Index, R/S Phrases (EU): Refer to Section 15 "Regulatory Information".

3. HAZARDS IDENTIFICATION

NFPA Ratings (Scale 0–4): Health = 1 Fire = 0 Reactivity = 0

Major Health Hazards: Difficulty in breathing, blood damage, suffocation.

Physical Hazards: Cylinder may rupture or explode if exposed to heat.

Potential Health Effects (Short Term Exposure)

Inhalation: Changes in body temperature, changes in blood pressure, nausea, vomiting, chest pain, difficulty breathing, irregular heartbeat, headache, drowsiness, dizziness, disorientation, hallucinations, pain in extremities, tremors, loss of coordination, hearing loss, visual disturbances, eye damage, suffocation, blood disorders, convulsions, coma.

Skin Contact: No information on significant adverse effects.

Eye Contact: Irritation, blurred vision.

Ingestion: Ingestion of a gas is unlikely.

Listed as a Carcinogen/Potential Carcinogen

	Yes	No
In the National Toxicology Program (NTP) Report on Carcinogens	_____	<u>X</u>
In the International Agency for Research on Cancer (IARC) Monographs	_____	<u>X</u>
By the Occupational Safety and Health Administration (OSHA)	_____	<u>X</u>

4. FIRST AID MEASURES

Inhalation: If adverse effects occur, remove to uncontaminated area. If not breathing, give artificial respiration by qualified personnel. Get immediate medical attention. **Note to Physician:** For inhalation, consider oxygen.

Skin Contact: Wash affected skin with soap and water for at least 15 minutes while removing contaminated clothing. Get medical attention, if needed.

Eye Contact: Immediately flush eyes, including under the eyelids, with copious amounts of water for at least 15 minutes. Get immediate medical attention.

Ingestion: Ingestion of gas is unlikely.

5. FIRE FIGHTING MEASURES

Fire and Explosion Hazards: Negligible fire hazard applicable to the identified NIST cylinder. Cylinder may rupture or explode if exposed to heat. Escaping gas mixture promotes combustion of surrounding materials.

Extinguishing Media: Regular dry chemical, carbon dioxide.

Fire Fighting: Move cylinder from fire area if it can be done without risk. Avoid inhalation of material or combustion by-products. Wear full protective clothing and NIOSH-approved self-contained breathing apparatus (SCBA).

Flash Point (°C): Not Applicable **Autoignition (°C):** Not Applicable **Method:** Not Applicable

Flammability Limits in Air (Volume %): Upper: Not Applicable

Lower: Not Applicable

Flammability Class (OSHA): Not applicable to the identified cylinder.

6. ACCIDENTAL RELEASE MEASURES

Occupational Release: Stop leak if possible without personal risk. Isolate hazard area and deny entry. Stay upwind and keep out of low areas. Refer to Section 13, "Disposal Considerations".

7. HANDLING AND STORAGE

Storage: Store and handle in accordance with all current regulations and standards. Secure cylinder to prevent physical damage. Keep valve protective cap on cylinder when not in use. Keep separated from incompatible substances. Subject to storage regulations: U.S. OSHA 29 CFR 1910.101.

Safe Handling Precautions: Wear safety goggles. See Section 8, "Exposure Controls and Personal Protection".

8. EXPOSURE CONTROLS AND PERSONAL PROTECTION

Nitrogen Gas

ACGIH (inhalation): simple asphyxiant

UK OES (inhalation): simple asphyxiant

Carbon Dioxide

OSHA TWA (inhalation): 9000 mg/m³ (5000 ppm)

ACGIH TWA (inhalation): 9000 mg/m³ (5000 ppm)

UK WEL TWA (inhalation): 9150 mg/m³ (5000 ppm)

Ventilation: Provide local exhaust or process enclosure ventilation system. Ensure compliance with applicable exposure limits.

Respirator: If necessary, refer to the “NIOSH Guide to the Selection and Use of Particulate Respirators Certified under 42 CFR 84” for selection and use of respirators with organic vapor cartridges certified by NIOSH.

Eye Protection: Wear safety goggles. An eye wash station should be readily available near of handling and use areas.

Personal Protection: Wear protective clothing and chemically resistant gloves to prevent skin exposure.

9. PHYSICAL AND CHEMICAL PROPERTIES

Nitrogen Gas	Carbon Dioxide Gas
Appearance and Odor: colorless and odorless	Appearance, Odor, Taste: colorless, odorless, acid taste
Molecular Weight: 28.01	Molecular Weight: 44.01
Molecular Formula: N ₂	Molecular Formula: CO ₂
Boiling Point (°C): -196	Boiling Point (°C): not available
Freezing Point (°C): -210	Freezing Point (°C): -79
Vapor Density (air = 1): 0.97	Vapor Density (air = 1): 1.5
Volatility (%): 100	Volatility (%): not applicable
Solubility in Water: slightly soluble	Solubility in Water: soluble
Solvent Solubility: soluble in liquid ammonia; slightly soluble in alcohol	Solvent Solubility: not applicable

10. STABILITY AND REACTIVITY

Stability: ☒ Stable ☐ Unstable

Stable at normal temperatures and pressure.

Conditions to Avoid: Avoid heat, flames, sparks and other sources of ignition. Minimize contact with material. Avoid inhalation of material or combustion by-products. Protect from physical damage. Cylinder may rupture or explode if exposed to heat.

Incompatibilities: Metals, oxidizing materials, halogens, metal oxides, metals, combustible materials, lithium.

Fire/Explosion Information: Refer to Section 5, “Fire Fighting Measures”.

Hazardous Decomposition: Thermal decomposition or combustion produces oxides of nitrogen and carbon.

Hazardous Polymerization: ☐ Will Occur ☒ Will Not Occur

11. TOXICOLOGICAL INFORMATION

Route of Entry: ☒ Inhalation ☐ Skin ☐ Ingestion

Nitrogen Gas

Compressed nitrogen gas is a simple asphyxiant.

Carbon Dioxide

LC_{LO} (inhalation-human): 9 pph/5 minute(s)

TC_{LO} (inhalation-mammal): 11 pph/2 hour(s)

Health Effects (Acute Exposure):

Carbon dioxide gas is not detectable by odor. At concentrations from 2–10% it may cause acidic taste, dyspnea, headache, vertigo, nausea, labored breathing, weakness, drowsiness, mental confusion, and increase in blood pressure, pulse, and respiratory rate. Exposure to 10% for a few minutes has been reported to cause visual disturbances, tinnitus, tremors, profuse perspiration, restlessness, paresthesias, general feeling of discomfort, loss of consciousness, and coma. Concentrations of 25-30% may cause coma and convulsions within one minute.

Nitrogen gas is a simple asphyxiant. The symptoms of asphyxia depend on the rapidity with which the oxygen deficiency develops and how long it continues. In sudden acute asphyxia, unconsciousness may be immediate. With slow development, there may be rapid respiration and pulse, air hunger, dizziness, reduced awareness, tightness in the head, tingling sensations, incoordination, faulty judgment, emotional instability, and rapid fatigue. As the asphyxia progresses, nausea, vomiting, collapse, unconsciousness, convulsions, deep coma and death are possible.

Medical Conditions Generally Aggravated by Exposure: Blood system disorders, heart or cardiovascular disorders, hormonal disorders, respiratory disorders.

12. ECOLOGICAL INFORMATION

Environmental Summary:

Nitrogen: No data available.

Carbon Dioxide LC₁₀₀ (fish): 150 mg/L/48 d

13. DISPOSAL CONSIDERATIONS

Waste Disposal: The cylinder is the property of the purchaser. Dispose in accordance with all applicable federal, state, and local regulations. Carbon dioxide is subject to disposal regulations: U.S. EPA 40 CFR 262, Hazardous Waste Number(s): D001.

14. TRANSPORTATION INFORMATION

U.S. DOT and IATA: Compressed Gas, N.O.S. (Carbon Dioxide in Nitrogen); UN1956; Hazard Class 2.2.

Canadian WHMIS: Compressed Gas, N.O.S. (Carbon Dioxide in Nitrogen); UN1956; Hazard Class 2.2.

15. REGULATORY INFORMATION

U.S. REGULATIONS

CERCLA Sections 102a/103 (40 CFR 302.4): Not regulated.

SARA Title III Section 302 (40 CFR 355.30): Not regulated.

SARA Title III Section 304 (40 CFR 355.40): Not regulated.

SARA Title III Section 313 (40 CFR 372.65): Not regulated.

OSHA Process Safety (29 CFR 1910.119): Not regulated.

SARA Title III Sections 311/312 Hazardous Categories (40 CFR 370.21)

ACUTE: Yes

CHRONIC: No

FIRE: No

REACTIVE: No

SUDDEN RELEASE: Yes

STATE REGULATIONS

California Proposition 65: Not Regulated.

CANADIAN REGULATIONS

WHMIS Classification: Not determined.

EUROPEAN REGULATIONS

EU Classification

Nitrogen: Not determined.

Carbon Dioxide: Not determined.

EU Risk and Safety Phrases

Nitrogen: Not determined.

Carbon Dioxide: Not determined.

NATIONAL INVENTORY STATUS

U.S. Inventory (TSCA): Listed on inventory.

TSCA 12(b), Export Notification: Not listed.

16. OTHER INFORMATION

Sources: MDL Information Systems, Inc., MSDS *Nitrogen*, 16 June 2005.
MDL Information Systems, Inc., MSDS *Carbon Dioxide*, 16 March 2006.

Disclaimer: Physical and chemical data contained in this MSDS are provided only for use as a guide in assessing the hazardous nature of the material. The MSDS was prepared carefully, using current references; however, NIST does not certify the data in the MSDS. The certified values for this material are given in the NIST Certificate of Analysis.